Claims

What is claimed is:

1. A fuel-conditioning skid for an engine, the fuel-conditioning skid comprising:

an inlet connectable to a source to receive a flow of fuel containing undesirable compounds;

an outlet connectable to the engine to deliver a flow of fuel that is substantially free of undesirable compounds;

an inlet cleaner in fluid communication with the inlet and operable to remove a portion of the undesirable compounds;

a compressor in fluid communication with the inlet cleaner, the compressor receiving the flow of fuel at a first pressure and discharging the flow of fuel at a second pressure, the second pressure being greater than the first pressure; and

a purifier in fluid communication with the inlet cleaner to receive the flow of fuel, the purifier operable to remove substantially all of the remaining undesirable compounds from the flow of fuel.

2. The fuel-conditioning skid of claim 1, wherein the inlet cleaner includes an inlet filter and a liquid separator.

3. The fuel-conditioning skid of claim 1, wherein the compressor includes a variable speed drive.

4. The fuel-conditioning skid of claim 1, wherein a flow of oil passes through the compressor and the compressor includes a fuel/oil separator.

5. The fuel-conditioning skid of claim 1, wherein the compressor includes a temperature-controlled valve that selectively diverts a portion of the oil to an oil cooler to maintain the oil temperature above a predetermined level.

6. The fuel-conditioning skid of claim 1, wherein the purifier includes a multi-stage chiller, each stage of the chiller operable to cool the flow of fuel below the temperature of the previous stage, each stage including a condensate drain positioned to drain a portion of the undesirable compounds from the flow of fuel.

7. The fuel-conditioning skid of claim 6, wherein the purifier includes an aftercooler receiving the flow of fuel from the compressor, the aftercooler operable to cool the flow of fuel;

a first stage heat exchanger receiving the flow of fuel from the aftercooler and further cooling the flow; and

a second stage heat exchanger receiving the flow of fuel from the first stage heat exchanger and further cooling the flow.

8. The fuel-conditioning skid of claim 7, wherein the purifier includes a carbon absorber tank that receives the flow of fuel from the second stage heat exchanger and a final filter that receives the flow of fuel from the carbon absorber tank and delivers the flow of fuel to the outlet.

9. The fuel-conditioning skid of claim 7, wherein the first stage heat exchanger includes a gas-to-gas heat exchanger, and wherein the flow of fuel exiting the second stage heat exchanger cools the flow of fuel within the first stage heat exchanger.

10. The fuel-conditioning skid of claim 7, wherein the second stage heat exchanger includes a plurality of refrigerant-to-gas heat exchangers, each heat exchanger individually selectable such that only one heat exchanger receives the flow of fuel from the first stage heat exchanger during steady-state operation.

11. The fuel-conditioning skid of claim 1, further comprising a bypass flow loop that selectively diverts a portion of the fuel from the purifier to the compressor to maintain the flow through the compressor above a predetermined level.

12. The fuel-conditioning skid of claim 1, further comprising a purge system operable to remove fuel and undesirable compounds from the compressor.

13. A combustion turbine engine comprising:

a generator operable to produce an electrical output;

an air compressor operable to produce a flow of high-pressure air;

a combustor receiving a flow of fuel and the flow of high-pressure air, the combustor combusting the flow of fuel and the flow of high-pressure air to produce a flow of products of combustion;

a turbine operable in response to the flow of products of combustion to drive the air compressor and the generator; and

a fuel-conditioning skid receiving a flow of fuel that includes undesirable compounds and delivering the flow of fuel to the combustor, the fuel-conditioning skid including:

a compressor receiving the flow of fuel at a first pressure and discharging the flow of fuel at a second pressure, the second pressure being greater than the first pressure;

a plurality of cooling stages, the flow of fuel entering each stage at an inlet temperature and exiting at an outlet temperature that is less than the inlet temperature, a final cooling stage discharging the flow of fuel to the combustor; and

a plurality of condensate drains, each drain associated with a cooling stage and operable to drain at least a portion of the undesirable compounds from the flow of fuel such that the flow of fuel is substantially free of undesirable compounds at the combustor.

14. The combustion turbine engine of claim 13, further comprising an inlet cleaner receiving the flow of fuel from the inlet, the inlet cleaner operable to remove at least a portion of the undesirable compounds within the flow of fuel.

15. The combustion turbine engine of claim 14, wherein the inlet cleaner includes an inlet filter and a liquid separator.

16. The combustion turbine engine of claim 13, wherein the compressor is an oil-flooded compressor that passes a flow of oil therethrough and wherein the fuel conditioning skid further includes a fuel/oil separator.

17. The combustion turbine engine of claim 16, wherein the compressor includes a temperature-controlled valve that selectively diverts a portion of the oil to an oil cooler to maintain the oil temperature above a predetermined level.

18. The combustion turbine engine of claim 13, wherein the plurality of cooling stages includes:

an aftercooler receiving the flow of fuel from the compressor, the aftercooler operable to cool the flow of fuel;

a first stage heat exchanger receiving the flow of fuel from the aftercooler and further cooling the flow; and

a second stage heat exchanger receiving the flow of fuel from the first stage heat exchanger and further cooling the flow.

19. The combustion turbine engine of claim 18, wherein the plurality of cooling stages includes a carbon absorber tank that receives the flow of fuel from the second stage heat exchanger and removes a portion of the undesirable compounds and a final filter that receives the flow of fuel from the carbon absorber tank and delivers the flow of fuel to the outlet.

20. The combustion turbine engine of claim 18, wherein the first stage heat exchanger includes a gas-to-gas heat exchanger, and wherein the flow of fuel exits the second stage heat exchanger and cools the flow of fuel as it enters the first stage heat exchanger.

21. The combustion turbine engine of claim 18, wherein the second stage heat exchanger includes a plurality of refrigerant-to-gas heat exchangers, each heat exchanger individually selectable such that only one heat exchanger receives the flow of fuel from the first stage heat exchanger during steady-state operation.

22. The combustion turbine engine of claim 13, further comprising a storage receiver tank positioned to receive and discharge a flow of fuel.

23. The combustion turbine engine of claim 13, further comprising a fuel input line connected to a fuel supply, the fuel input line operable to augment the flow of fuel to the engine.

24. The combustion turbine engine of claim 13, further comprising an outlet filter stage receiving the flow of fuel and removing a portion of the undesirable compounds before discharging the flow of fuel to the combustor.

25. The combustion turbine engine of claim 13, further comprising a bypass flow loop that selectively directs a portion of the fuel from the final cooling stage to the compressor to maintain the flow through the compressor above a predetermined level.

26. A method of conditioning a flow of fuel to make the flow of fuel suitable for combustion within an engine, the method comprising:

delivering the flow of fuel to a fuel-conditioning skid, the flow of fuel including undesirable compounds;

filtering the flow of fuel to remove at least a portion of the undesirable compounds from the flow of fuel;

compressing the flow of fuel;

cooling the flow of fuel in a plurality of cooling stages to condense at least a portion of the undesirable compounds;

draining the condensed undesirable compounds from the flow of fuel during each of the plurality of cooling stages; and

directing the flow of fuel to the engine.

27. The method of claim 26, wherein the filtering step includes passing the flow of fuel through a filter and a moisture separator.

28. The method of claim 26, wherein the cooling step includes passing the flow of fuel through a refrigerant-to-gas heat exchanger.

29. The method of claim 28, wherein the cooling step includes passing the flow of fuel through a first side of a gas-to-gas heat exchanger before directing the flow of fuel through the refrigerant-to-gas heat exchanger, and directing the flow of fuel from the refrigerant-to-gas heat exchanger through a second side of the gas-to-gas heat exchanger.

30. The method of claim 26, further comprising passing the flow of fuel through a carbon media.

31. The method of claim 26, wherein the compressing step includes providing a flow of oil to the compressor and selectively diverting a portion of the flow of oil to an oil cooler to maintain the oil temperature above a predetermined level.

32. The method of claim 26, further comprising selectively redirecting a portion of the flow of fuel to the compressor following the cooling step to maintain the flow of fuel through the compressor above a predetermined level.

33. The method of claim 26, further comprising varying a speed of the compressor to achieve a desired fuel pressure.

34. The method of claim 33, wherein the varying step includes utilizing a proportional-integral-derivative control loop and a variable frequency drive to change the speed of the compressor.